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REFLECTIONS ON PSI: GOOD NEWS AND BAD

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Kierkegaard wrote, "life must be understood backwards, but it must be lived forwards." This is clearly a handicap for us all! The request to write some comments on the personalized system of instruction (PSI) seemed like a good opportunity to see if looking back on what happened makes more sense than it did living through it!

PSI was developed by a group deeply involved in the study of learning theory. It was an application of reinforcement theory that took the three-term contingency seriously. My view has always been that instruction must provide for (a) presentation, (b) performance, and (c) consequences, each constantly adjusted to meet the needs of every individual student. Otherwise, the teaching is inadequate and defective. Most teaching focuses primarily, often exclusively, on presenting information. This neglects what the student does (if anything) and what feedback is provided (if any). No matter that the student is absent, confused, or utterly lost, instruction proceeds apace. This is the source of most of education's problems. PSI was devised as a process that would not leave any part of the contingency to chance. Chance produces the normal curve.

Implementing the functional requirements of the three-term contingency produced the formal characteristics of PSI: mastery, specified objectives, self-pacing, small-step sequenced materials, repeated testing, immediate feedback, credit for success rather than penalty for errors, proctors, and lectures for motivation. Listing these features of PSI in this way yields a collection of terms that may appear arbitrary or capricious. It is neither. A combination of theory and practicality makes the list compelling. For example, the need to adjust the presentation of information according to the student's achievement and understanding requires frequent, almost constant, testing. Immediate feedback from such assessment, in practice, requires proctors. If a high frequency of behavior is to be encouraged so that progress can be selectively rewarded, punishing errors is the wrong way to go about it. A full exposition of all the components would require a recapitulation of much of the literature; this is not the purpose of my commentary. The basic system was described in the *PSI Keller Plan Handbook* (Keller & Sherman, 1974).

There is one further characteristic of PSI: It leaves a record. Data are almost inevitably generated that provide information about the adequacy of the materials, the optimal frequency of testing, the effectiveness of the proctors, the learning style of the student, the appropriate size of a study unit, the effects of introducing a grading system or constraining self-pacing—the effectiveness of the system as a whole, and the effect of its various components. The PSI format is an excellent research tool (Semb, 1976). It has produced a remarkable number of research studies, probably over 2,000.

The first reports compared PSI with more conventional teaching. There were almost too many of these; the message was always the same. An early summary of this type of research was provided by Taveggia (1976). He wrote, "The major conclusion suggested by this summary of research is that, when evaluated by average student performance on course content examinations, the Personalized System of Instruction has proven superior to the conventional teaching methods with which it has been compared" (p. 1032). This was exciting, particularly because it came from a critic of educational research, unassociated with PSI, who was best known for articles demonstrating that nothing one does in the classroom makes any difference (e.g., Dubin & Taveggia, 1968). In earlier studies these authors had

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The *PSI: Keller Plan handbook* (1974) is out of print. A limited number of copies are available by writing the address above.

examined data from over 350 reports comparing methods and media of instruction from 1924 through 1965. About *those* studies they said, "The unequivocal conclusion to emerge from this reanalysis of research was that there is no demonstrable difference between the measured college teaching methods (e.g., lecture, group discussion, tutorial, etc.) or media (e.g., face-to-face instruction, educational television) . . ." (Taveggia, 1976, p. 1028). The positive conclusion regarding PSI was a "first."

That was not the end of the good news. In 1979 Kulik et al. published a comprehensive analysis of outcome studies (Kulik, Kulik, & Cohen, 1979). They wrote:

> Like earlier reviews, the present study shows that PSI has an effect on student achievement in college courses: it also describes the size of this effect. PSI final examinations average about 8 percentage points higher than examinations from conventional classes. . . . This means PSI raises the final examination score of a typical student in a typical class from the 50th to the 70th percentile. It also means that PSI raises performance of typical students (with SAT scores of 500) to the level previously associated with above average students (with SAT scores of 600). (p. 317)

There were other conclusions in the Kulik et al. (1979) study. Four are noted here:

1. "A somewhat larger PSI effect—an improvement of about 14 percentage points—is found when achievement examinations are administered several months after the end of the course" (p. 317).

2. "Differences between PSI and control classes also tend to be more pronounced on essay than on objective examinations" (p. 317).

3. "Differences in student ratings of PSI and control classes are also pronounced. Students rate PSI classes as more enjoyable, more demanding, and higher in overall quality and contribution to student learning than conventional classes" (p. 317).

4. "The size of PSI–control differences was also related to the discipline in which a course was offered. But even when PSI–control differences were smallest, PSI superiority was still quite apparent, and PSI had a statistically demonstrable effect on student achievement. The superiority of personalized instruction was clear under a variety of conditions and with good and poor research designs" (p. 317).

These are not trivial results. It has always seemed to me that retention data have methodological advantages over simple final exam comparison. In any case, retention is a highly desirable goal of instruction, and PSI is effective for this purpose. Contrary to a frequent criticism, PSI is not limited to just factual material and objective testing (see Reboy & Semb, in press). The student preference data are both satisfying and important. Not all students are delighted (a single, vocal, unhappy student can cause a fair amount of trouble, and should have alternatives), but again and again 75% to 90% of students register a preference for PSI courses. The fourth point says something about the strength of all these comparative results. Sidman wrote at length on how the generality of a finding is enhanced by replications under differing conditions (Sidman, 1960). Here we have a robust finding.

With the comparative question fairly well settled, research turned to the component analysis of the various features of PSI. Here again Kulik, Jakse, and Kulik (1978) provided a summary. I will not review this literature, but most characteristics of PSI proved to have some merit—with the possible exception of lectures, which seemed to "have no discernible effect on student achievement" (p. 12).

From research and practice PSI began to be refined. Proctor training was studied (Johnson, 1977; Robin & Heselton, 1977), internal proctors were introduced (Sherman, 1971, 1977), unit structure was investigated (Koen, 1973), procrastination was identified as a problem and explored (Glick & Semb, 1978). The PSI approach seemed to be a self-examining and self-modifying procedure: a healthy situation. There were PSI courses taught at all levels of education, from elementary school (Klishis, Hursh, & Klishis, 1980) through college and graduate programs; in almost every conceivable subject matter, from philosophy (Ross & Semb,

1981) to sailing on the Charles in Boston! There were PSI courses in the military (McMichael, Brock, & Delong, 1976) and in industrial settings (Tosti & Jackson, 1980). The number of PSI courses was increasing. In 1973, the Center for Personalized Instruction was established at Georgetown University, cooperatively funded by the Fund for the Improvement of Post Secondary Education (FIPSE) and the Carnegie Corporation of New York. The Center published the *PSI Newsletter* and the *Journal of Personalized Instruction,* served as an information clearing house, offered workshops on PSI course design, and sponsored national conferences. There was a support system for PSI.

The Bad News

Here we have a conundrum. There is nearly universal agreement that U.S. schools are failing. On the other hand, PSI is a teaching procedure that works. Thus, we have a real need and a documented, proven method for improvement. The next step, one might think, would be almost inevitable. The happy story told up to this point should pale beside a continuing account of widespread implementation, proliferating research, a constantly improving methodology, all with the happy result of rising SAT scores. This is not what happened. Why?

In part the answer may be an analogue of the typewriter keyboard, just as simple and as hopeless. The letter armatures of early typewriters returned to the resting position by nothing more than the force of gravity. This action is relatively slow. It was critical that successive keys not be struck too rapidly. Applied psychologists were hired, and conducted research, to design a keyboard configuration that would produce the slowest possible response rate. They did, and we are still stuck with that slow configuration. Other, better (i.e., faster) keyboards have been developed and even marketed, but none have succeeded in replacing the standard, inefficient typewriter keyboard—the worst possible configuration that could be designed!

The same kind of inertia is certainly found in the education system. The educational establishment is enormous, the constituencies are multiple and diverse, often with conflicting interests. The barriers to educational reform are formidable, even awesome. The power, the money, the investment in keeping things as they are may be impossible to overcome. Recommendations may be acceptable only if they don't change things very much. Improving instruction is the goal, but only in the context of not changing anything that is important to any vested interest. We may be stuck with the system we have, always seeking some modifications to solve the problem without disturbing anything.

When we examine proposals for reform, every conceivable change seems to have been suggested except tampering with the core, the heart of the matter—traditional teaching practices. Stating goals and establishing higher standards are popular and quite useless without accompanying specifics of how these objectives are to be met. A wish list is a cheap way out. When specifics are suggested, these include such things as lengthening the school year, increasing parent involvement, establishing magnet schools, identifying and rewarding "great teachers," instituting a teacher accountability system (like outcome-based instruction), setting standards for teacher training and certification, and so on. Although there may be merit in many of these "innovations," they all leave intact the basic procedures of teaching, the relation between the student and the information being presented.

One exception to this is the recommendation to introduce or augment computer-based instruction (CBI). This suggestion does focus directly on instruction and for once instruction that is adaptive rather than linear. Computer-based instruction meets the conditions of the three-term contingency, and in being interactive, PSI and CBI share many features. When talking with both teachers and teacher's union officials, I have found CBI to be less threatening and more acceptable to many who will not consider PSI. Phrased in many different ways, the difference seems to be that CBI can be seen as a supplement. In other words, computer-based instruction can be assigned as a separate exercise, leaving teachers to do what teachers have always

done. It is true that PSI requires a drastic change in the instructor's role. So drastic it reminds me of Will Rogers' comment on watching homecoming parades after World War I: "If they really want to honor the boys, why don't they let them sit in the stands and have the people march by?" In PSI it is the teachers who ask the questions, the students give the answers, and the teachers say "you are getting warmer, you are getting colder." This is an oversimplification of all the PSI teacher has to do (see Keller & Sherman, 1974), but it does capture the magnitude of the change involved. Some of us find the change more rewarding because you see, moment to moment, student progress and the delight in learning that success brings to the student. However, the role of the PSI teacher does not conform to what most people think of as teaching; this is a problem and an obstacle to implementation.

However, not all of what happened, or didn't happen, to PSI can be ascribed to inertia in the educational system or to resistance to changing the role of the teacher. Some difficulties arose within the community of those teaching PSI courses and encouraging further development. Two problems from the PSI story may have relevance for other attempts at innovation. The first, strangely enough, was the question of defining PSI, or at least setting defining limits. Earlier I reviewed the major characteristics of PSI. It was easy to do, and I doubt my account would produce any serious controversy. What happens when someone decides to make changes, for example to grade each quiz, allow only two attempts per unit, restrict self-pacing to the point at which a unit must be passed each week? Is it a PSI course or not, and who is to say? Suppose such a course is a failure. Is it an instance of PSI failure?

The definition problem was sometimes acute at the Georgetown Center for Personalized Instruction. Decisions had to be made about accepting papers at conferences and including items in the *PSI Newsletter*; these proved most vexing when it came to the journal. A rigid definition can freeze the method into a numbing formula and limit the audience. In fact, editorial decisions based on a strict definition brought more than a few charges of authoritarianism. On the other hand, a very broad definition makes PSI so inclusive as to be meaningless. As I recall, Keller coined the name SLI (Something Like It) for variations that departed in important ways from what he described in "Good-bye, teacher" (Keller, 1968). But where is the line between PSI and SLI? Once a rogue (and only a rogue would make such a remark) said accusingly, "If the data are good you call it PSI, if not you call it SLI, and PSI wins either way!" It is easy to make light of the problem, but the issue produced "conservatives" and "liberals" and arguments that were not always totally friendly. I think I can recall similar discussions about the domain of the experimental analysis of behavior and related journal policy. No definition statement satisfying everyone ever emerged. I don't have an answer to the problem even now. The best I can do is warn others who would undertake such ventures that there is a very divisive issue here.

The second problem is that educational innovators are often not good disseminators. Dissemination becomes promotion, a dirty word and base activity to the scholar. This issue also plagued the Center. The commitment under the terms of the originating grants was that the Center become self-supporting. By charter there had to be charges for Center services. It was the tendency of us all to keep fees to a minimum. There was unanimity in our being more interested in providing information than in being a commercial success. Even so, there were serious differences, even a resignation, over the fee question. This dispute took much of the spirit out of the Center. I can report that the Center was about 80% self-supporting as the grant period came to an end. Had there been a bit more understanding, tolerance, and flexibility, the Center might well have become self-sustaining. It is difficult to play "what if," but had that happened the story of PSI might be different now. Without a dedicated journal, the number of research articles has declined. Information about PSI is increasingly difficult to come by. Several source books are out

of print. No one knows how many PSI courses are being taught at this time.

One other kind of event must be mentioned. Some PSI courses have been prohibited in spite of their success. I know of several colleagues who were given "cease and desist" orders. Some are names prominent in the literature, their courses effective, according to objective data. I experienced this also. Avoiding a frontal attack, the chairman of the Psychology Department at Georgetown declared by fiat that something on the order of 50% of class time must be devoted to lecturing. By reducing the possibility of self-pacing to zero, this effectively eliminated PSI courses. He issued this order on the grounds that in the context of lecturing "it is the clash of intellects in the classroom that informs the student." No data were presented on this point! The spectacle of purporting to defend scholarship while deciding the merits of instructional methods by assertion is silly. The troubling aspect of all these cases was that data played no part in the decisions. It is disturbing when one has to wonder whether research on the education process makes any difference.

These cases raise the interesting issue of whether academic freedom protects not only what we teach but how we teach it. If an alternative teaching method is effective according to objective data, can it be prohibited? In my case it was unappealing to pursue the matter with those whose intellectual honesty I could not respect, but the question is an interesting one.

There are other matters that could be discussed, but this is enough to characterize my experiences with PSI. An idea was developed, a method described, and a great deal of instructive research accomplished. Some complex issues were raised. There is a lot more we need to know about instruction. There are PSI courses now being taught and they will contribute further. There are other sources of research on instruction that share a similar perspective. The work started by Ogden Lindsley makes learning visible and adds to our understanding. Don Cook's efforts with computer-based instruction enlighten us about constructing better software and the writing of instructional materials in general. The peer tutoring literature advances the proctor function in PSI. Direct instruction, precision teaching, CBI, and PSI share many features. From them all we may expect improvement, because unlike the kind of instruction that is failing today, they all obey the law: the conditions set by the three-term contingency. There is a sign posted over a bar in Key West that reads, "Gravity isn't just a good idea, it's the law." The three-term contingency isn't just a good idea either. Any procedure that follows this law is a step in the right direction.

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